

Docket No. 520.38979CX1
Appln. No. 10/671,608
February 10, 2006

AMENDMENTS TO THE CLAIMS:

The following listing of claims replaces all prior listings, and all prior versions, of claims in the application.

LISTING OF CLAIMS:

1. – 9. (Cancelled).

10. (Currently amended) A surface processing method according to Claim 244, wherein frequency for cyclic on-off control of said radio frequency voltage ranges from 100 Hz to 10 kHz.

11. (Cancelled).

12. (Currently amended) A surface processing method according to Claim 244, wherein said radio frequency bias voltage applied has a frequency ranging from 20 kHz to 20 MHz.

13. – 20. (Cancelled).

21. (Previously presented) A surface processing method of a sample comprising multilayer film of n-type polycrystalline silicon and p-type polycrystalline silicon laminated on an oxide film, comprising steps of:

installing said sample on a sample board in a vacuum container;
generating a plasma of a gas inside said vacuum container;
applying a radio frequency bias voltage on said sample board; and

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treating said sample by said plasma, said treating including etching, wherein the etching includes:

etching said n-type polycrystalline silicon and said p-type polycrystalline silicon by introducing mixed gas containing fluorine and oxygen into said vacuum container while applying periodically on-off controlled radio frequency bias voltage, and

after exposing of said oxide film, continuously etching by changing said etching gas into mixed gas containing hydrogen bromide and oxygen, and changing said radio frequency voltage into continuous application.

22. (Previously presented) A surface processing method of a sample comprising multilayer film of polycrystalline silicon laminated on an oxide film and metal film laminated on the polycrystalline silicon film, comprising steps of:

installing said sample on a sample board in a vacuum container;
generating a plasma of a gas inside said vacuum container;
applying a radio frequency bias voltage on said sample board; and
treating said sample by said plasma, said treating including etching, wherein the etching includes:

etching said metal film by introducing mixed gas containing fluorine and oxygen into said vacuum container while applying said radio frequency bias voltage continuously,

etching said polycrystalline silicon by introducing mixed gas containing fluorine and oxygen into said vacuum container while applying periodically on-off controlled radio frequency bias voltage, and

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after exposing of said oxide film, continuously etching by changing said etching gas into mixed gas containing hydrogen bromide and oxygen, and changing said radio frequency voltage into continuous application.

23. (New) A surface processing method of a sample having a metal of high melting point or multilayer film comprising at least metal of high melting point and semiconductor deposited on a substrate, comprising steps of:

installing said sample on a sample board in a vacuum container,

introducing a plasma gas containing fluorine atom or a mixed gas containing fluorine atom and oxygen atom inside said vacuum container and generating a plasma of said plasma gas,

applying a radio frequency bias voltage on said sample board, and

controlling a periodic on-off of the radio frequency bias voltage with an on-off control,

wherein said processing step is divided into plural steps, the net power of the radio frequency power applied to said sample is reduced at least in the last step, and said sample is treated by said plasma.

24. (New) A surface processing method of a sample having a metal of high melting point or multilayer film comprising at least metal of high melting point and semiconductor deposited on a substrate, comprising steps of:

installing said sample on a sample board in a vacuum container,

introducing a plasma gas containing fluorine atom or a mixed gas containing fluorine atom and oxygen atom inside said vacuum container and generating a plasma of said plasma gas,

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applying a radio frequency bias voltage on said sample board, and
controlling a periodic on-off of the radio frequency bias voltage with an on-off
control frequency,

wherein a percentage of on-period accounts for 5 to 60% in a cycle of on-off
control of said radio frequency voltage, and said sample is treated by said plasma.

25. (New) A surface processing method wherein a sample where a mask
layer without containing carbon as a major component formed on a substance to be
processed is laid on a sample board in a vacuum container, plasma is generated
inside said vacuum container, radio frequency bias voltage is applied on said sample
board, and plasma treatment is provided by periodic on-off control of radio frequency
bias voltage applied on said sample board; wherein

said plasma consists of a mixture of halogen gas and adhesive gas,

said halogen gas is a mixed gas of chlorine and BCl_3 , and

wherein the bias voltage applied to said sample board is characterized in that
a percentage of on-period accounts for 5 to 60% in a cycle of on-off control of said
radio frequency voltage.

26. (New) A surface processing method wherein a sample where a mask
layer without containing carbon as a major component formed on a substance to be
processed is laid on a sample board in a vacuum container, plasma is generated
inside said vacuum container, radio frequency bias voltage is applied on said sample
board, and plasma treatment is provided by periodic on-off control of radio frequency
bias voltage applied on said sample board; wherein

said plasma consists of a mixture of halogen gas and adhesive gas,

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said halogen gas is a mixed gas of chlorine and BCl_3 , and
a mixing rate of the adhesive gas to be mixed with said halogen ranges from
0.5% to 50%.